

**WE CLAIM:**

1. A polymer electrolyte membrane fuel cell stack comprising:  
a plurality of substantially planar fuel cell units, each said fuel cell unit comprising an anode electrode, a cathode electrode and a polymer electrolyte membrane disposed between said anode electrode and said cathode electrode; and  
a metal bipolar plate disposed between said anode electrode of one said fuel cell unit and said cathode electrode of an adjacent said fuel cell unit, said metal bipolar plate comprising a chromium-nickel austenitic alloy having a nitrogen content of zero, wherein said chromium and said nickel, on a combined basis, comprise at least about 50% by weight of said alloy.

2. A polymer electrolyte membrane fuel cell stack in accordance with Claim 1, wherein said nickel comprises a greater percentage of said alloy than said chromium.

3. A polymer electrolyte membrane fuel cell stack in accordance with Claim 2, wherein said nickel comprises at least about 32% by weight of said alloy.

4. A polymer electrolyte membrane fuel cell stack in accordance with Claim 3, wherein said nickel comprises in a range of about 32% to about 38% by weight of said alloy.

5. A polymer electrolyte membrane fuel cell stack in accordance with Claim 1 further comprising a current collector disposed on a side of each said electrode facing said metal bipolar plate, said current collectors comprising said chromium-nickel alloy.

6. A polymer electrolyte membrane fuel cell stack in accordance with Claim 1, wherein at least a portion of said metal bipolar plate is in direct contact with said polymer electrolyte membrane.

7. A polymer electrolyte membrane fuel cell stack in accordance with Claim 1, wherein said metal bipolar plate is not coated by a protective coating.

8. A polymer electrolyte membrane fuel cell stack comprising:  
a plurality of substantially planar fuel cell units, each said fuel cell unit comprising an anode electrode, a cathode electrode and a polymer electrolyte membrane disposed between said anode electrode and said cathode electrode;  
a bipolar plate disposed between said anode electrode of one said fuel cell unit and a cathode electrode of an adjacent said fuel cell unit;  
a current collector disposed between each of said electrodes and said bipolar plate; and  
at least one of said bipolar plates and said current collector comprising a chromium-nickel austenitic alloy having a nitrogen content of zero, wherein said chromium and said nickel, on a combined basis, comprises at least about 50% by weight of said alloy.

9. A polymer electrolyte membrane fuel cell stack in accordance with Claim 8, wherein said bipolar plate is a graphite plate.

10. A polymer electrolyte membrane fuel cell stack in accordance with Claim 8, wherein said nickel comprises a greater percentage of said alloy than said chromium.

11. A polymer electrolyte membrane fuel cell stack in accordance with Claim 9, wherein said graphite plate is molded directly onto at least one of said current collectors.

12. A polymer electrolyte membrane fuel cell stack in accordance with Claim 8, wherein said nickel comprises at least about 32% by weight of said alloy.

13. A polymer electrolyte membrane fuel cell stack in accordance with Claim 8, wherein said alloy further comprises C, Mn, Si, P, S, Mo, Nb and Cu.

14. In a polymer electrolyte membrane fuel cell stack comprising a plurality of fuel cell units, each said fuel cell unit comprising an anode electrode, a cathode electrode and a polymer electrolyte membrane disposed between said anode electrode and said cathode electrode, and a bipolar plate disposed between said anode electrode of one said fuel cell unit and said cathode electrode of an adjacent said fuel cell unit, the improvement comprising:

said bipolar plate comprising a chromium-nickel austenitic alloy having a nitrogen content of zero, wherein said chromium and said nickel, on a combined basis, comprises at least about 50% by weight of said alloy.

15. A polymer electrolyte membrane fuel cell stack in accordance with Claim 14, wherein said nickel comprises a greater percentage of said alloy than said chromium.

16. A polymer electrolyte membrane fuel cell stack in accordance with Claim 14, wherein said nickel comprises at least about 32% by weight of said alloy.

17. A polymer electrolyte membrane fuel cell stack in accordance with Claim 14, wherein said bipolar plate is uncoated.